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The Price of Proximity: Black Women Disproportionately Exposed to Superfund Metals

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An estimated 21 million Americans live within a mile of a Superfund site.[1] To learn more about how that proximity might affect health, investigators looked at metal biomarker levels among women who lived near a Superfund site and published their findings in an *Environmental Health Perspectives* research letter.[2] They reported that non-Hispanic Black women were likely to have higher levels of certain metals than their non-Hispanic White counterparts—even when they lived the same distance from a site.

"We don't have a lot of information about the possible health impacts of living near a Superfund site even though these sites are highly prevalent," says senior author Alexandra White, who leads the Environment and Cancer Epidemiology group at the National Institute of Environmental Health Sciences. "These sites tend to be concentrated in areas with higher proportions of non-White individuals and may be disproportionately affecting lower-income individuals. We wanted to broadly explore the impacts of living near one of these sites."

The study used data from nearly 3,000 Black and White participants in the Sister Study,[3] which had collected biological samples from more than 50,000 women across the United States and Puerto Rico. The researchers analyzed toenail clippings from women whose enrollment addresses could be geocoded. Toenail clippings are easy to collect and store, and their metal concentrations remain stable over time, explains White, a Sister Study investigator. Using mass spectrometry, her team quantified arsenic, cadmium, lead, and antimony—metals included on the Substance Priority List of the 275 greatest chemical threats at Superfund sites. The list is maintained by the Agency for Toxic Substances and Disease Registry.[4]

The researchers found that living closer to Superfund sites was associated with higher concentrations of metals in toenail clippings. For lead and cadmium, these associations were stronger for non-Hispanic Black women than for non-Hispanic White women. The team also reported that non-Hispanic Black women lived near a slightly higher density of Superfund sites polluted with any type of metal than did non-Hispanic White women.

"The results were pretty consistent with what we expected," White says. She says these findings suggest that Black women may be more likely to live in areas with multiple sources of metal exposure, potentially a result of residential segregation and environmental racism.

"Toenails are an under-utilized biosample in metals research," says Yoshira Ornelas Van Horne, an exposure scientist and environmental justice scholar at Columbia University who was not affiliated with the study. "It is fantastic to see the toenail samples from the nationwide Sister Study be studied in connection with Superfund sites, allowing the researchers to explore an exposure

In this 2017 photo, a resident of Camden, New Jersey, pushes a stroller near the Martin Aaron Inc. Superfund site. Image: © AP Photo/Matt Rourke.

metric that took into account both proximity to and density of Superfund sites."

This cumulative view of exposure susceptibility is a strength of the research letter, notes Ornelas Van Horne. "I appreciate that the authors included various confounders in their models, including smoking status, primary source of drinking water, and proximity to airports, as these are well-established sources of metals exposure," she says. "The authors also acknowledged the role of residential segregation and racism as an underlying root cause of these environmental exposures. I think what are now needed are action-oriented solutions."

To that end, White says that from a public health standpoint, the study's results support the need for increased resources for Superfund cleanup. There are currently more than 1,300 sites on the U.S. Environmental Protection Agency's (EPA) National Priorities List of sites waiting for eventual cleanup.[5] According to a 2015 Government Accountability Office report,[6] federal funding for the Superfund program declined by nearly half from 1999 to 2013, and the annual number of completed site remediations has also trended downward. There was an upsurge of funding in December 2021, however, when Congress announced it would infuse $1 billion into 49 previously unfunded sites and accelerate cleanup at dozens more; a second round of funding was announced in February 2023.[7]

When asked how people living near Superfund sites could use the study's information to inform lifestyle changes to mitigate exposure risk, White suggests that using filters for drinking water or indoor air might help. "But it's not fair to put the burden on the individual," she says. "You might not know you live near a site, what contaminants are present, or the best way to avoid exposure." White further notes that the issue of disproportionate exposure is structural, and that systemic change on state and federal levels is needed: "We need to consider how close future industrial sites can be located to residential areas."

She points to the U.S. EPA's EnviroAtlas Interactive Map[8] as a powerful tool for individuals to explore what environmental hazards may exist in the communities where they live. White asserts that continued research is needed into the exposure risks that people face depending on where they live.

"I hope these findings will bring an increased awareness to the possibility that these sites are influencing the health of nearby residents," she says. "These sites disproportionately relate to the body burden of chemicals in more vulnerable populations. We have a responsibility to address this inequitable distribution of waste."

Kelley Christensen is a science writer and editor in Eugene, Oregon, where according to the EnviroAtlas, phosphorus concentrations are high.

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